

The Genus *Medinilla* Gaudich. ex DC. (Melastomataceae) in Peninsular India

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Abstract

Four species of *Medinilla* Gaudich. ex DC. are reported from Peninsular India. All are endemic and confined to the southern Western Ghats. *Medinilla sahyadrica* is described as new. It is a species wrongly identified as *M. fuschioides*, a taxon confined to Sri Lanka and reported as new record for India from this region. Nomenclature, description, illustration and distributional map of these species are provided. Vegetative and reproductive characters were analyzed in detail and used to key out the species.

Keywords: *Medinilla*, Peninsular India, Systematics, New species

Introduction

Medinilla Gaudich. ex DC., an Old World genus, is distributed in the tropical rain forests of Africa and Asia, especially South East Asia. Bodegom and Veldkamp (2001) reported 362 species in this genus but the latter recently modified the count to 430 species (pers. comm.). In Asia, the distribution of this genus ranges from Himalaya southwards to Sri Lanka and southeastwards to the islands of Malay Archipelago, New Guinea, Northern Australia and Fiji (Regaldo, 1995). South Asia is comparatively poor in the diversity of *Medinilla*. About 300 species are reported from the Indo-Malayan region (Nayar, 1966; Regaldo 1990, 1995) and most of them are narrow endemics. Though the genus is widespread in Asia and Africa, there is no species common to both the continents.

Clarke (1879) reported 11 species of *Medinilla* from the erstwhile British India, eight species from the present Indian region and three from Sri Lanka. Three species are known from Peninsular India (Gamble, 1919; Sasidharan & Sujanapal, 2002) and four species from subtropical Himalayas and Assam hills including a new species reported from Arunachal Pradesh (Pal, 1995). Recently, *M. quadrifolia* was reported from Andaman and Nicobar Islands (Jayanthi *et al.*, 2003). Among the eight species recorded from India, *M. malabarica*, *M. beddomei*, *M. anamalaiana* and *M. arunachalica* are restricted to the southern Western Ghats. Species such as *M. himalayana* and *M. pauciflora*

are confined to subtropical Himalayas. In the northeast, Khasi-Jaintea hills and Darjeeling are the important distributional zones of this genus. Distribution of *M. rubicunda* is extended up to Sumatra. *M. quadrifolia*, a species recently reported from Andaman and Nicobar Islands, has wider distributional range from Andaman and Nicobar Islands to Malay peninsula, Sumatra, Borneo, Java and Philippines. Probably, this is the widely distributed species in *Medinilla*. All the four species of *Medinilla* reported from Peninsular India are restricted to the Western Ghats and there is no species which is common to Sri Lanka and Peninsular India.

Materials and Methods

This revision is based on two years of field study in Peninsular India. During the field trip data on phenology, morphological characters and distributional patterns of the species were recorded. GPS was used to record the latitudinal and longitudinal positions of the sites of occurrence. Mapping was done with the latest version of the software 'MAPINFO'. Specimens at Kew (K), Madras Herbarium(MH), Kerala Forest Research Institute (KFRI) and Calicut University(CALI) were subjected to critical study. Type specimens or cibachromes were consulted. The ratio of similarities were analyzed

using the statistical software 'SPSS' (version 12.0) based on 25 most reliable characters related to habit, stem, leaves, inflorescence and flowers from different populations.

Ecology

As a shade loving genus, undisturbed evergreen and shola forests are the ideal habitats of all the four Peninsular Indian *Medinilla*. However, *M. beddomei* is adapted to grow on trees or rocks in the moist substratum of evergreen, semi-evergreen and moist deciduous forests. *M. beddomei* and *M. anamalaiana* are found restricted to altitudes normally below 1400 m. The other two species are usually found at higher altitudes. *M. malabarica* occurs upto 2300 m. in sholas. Except *M. beddomei* which is a climbing plant, all other species are clump forming and growing on trees. Rarely, *M. sahyadrica* grows as terrestrial subshrubs. The habitat of *M. beddomei* is comparatively dry. *M. beddomei* and *M. sahyadrica* are gregarious in growth pattern.

Birds such as White browed bulbul (*Pycnonotus luteolus*), Blue winged parakeet (*Psittacula columboidea*), Pied crested cuckoo (*Clamator jacobinus*), Indian plaintive cuckoo (*Cacomantis sonneratii*), Crimson breasted barbet (*Megalaima haemacephala*), Scalet minivet (*Pericrocotus flammeus*), Small minivet (*Pericrocotus cinnamomeus*), Grey headed bulbul (*Pycnonotus priocephalus*), Ruby throated bulbul (*Pycnonotus melanicterus*), Yellow browed bulbul (*Hypsipetes indicus*) and Black bulbul (*Hypsipetes madagascariensis*) visit the species for nectar and fruits.

The identity of *M. fuchsioides* reported from India

Shetty and Karthikeyan (1976) reported the occurrence of *M. fuchsioides*, a Sri Lankan species, from Mahendragiri hills, Kanyakumari district, Tamilnadu, which was considered endemic to Sri Lanka. We collected similar specimens from Periyar Tiger Reserve, Kerala. These specimens were compared with the Isolectotype of *M. fuchsioides* Gardner [Ceylon, Gardner C.P. 138 (Accn No. 60933 MH)] and descriptions of Clarke (1879) and Bremer (1987). They were found different from Gardner's *M. fuchsioides*, originally described from Sri Lanka, in nature and texture of stem, leaf, number of ribs, type of inflorescence, nature of bracteoles and stamen. Based on our further studies, we concluded that the specimens collected by Shetty from Mahendragiri Hills of Tamilnadu [(BV Shetty 33084 (MH) Kandakki, Panagudi, 1210 m, 8 December 1969)] were not *M.*

fuchsioides and they belonged to an undescribed species, here named as *M. sahyadrica*, more allied to *M. malabarica*. All the four species are described with keys for identification.

Medinilla Gaudichaud ex De Candolle

Medinilla Gaudich. ex DC., Prodr. 3:167. 1828; Gaudich., Freyc. Voy. Uranie Bot. t. 106.1829; 484. 1830. Cogn., DC. Monogr. Phan. 7:572. 1891. *Diplogenea* Lindl. Quart. Jour. Sci. Arts 2:128. 1828. *Triplectrum* D. Don ex Wight & Arn., Prodr. 324. 1834. *Dactyliota* Blume, Mus. Bot. Lugd. Bat. 1:21. 1849. *Hypenanthe* Blume, Mus. Bot. Lugd. Bat. 1:21. 1849. *Erpetina* Naudin, Ann. Sci. Nat., III, 15:299. 1851. *Medinillopsis* Cogn., in DC. Monogr. Phan. 7:603. 1891. *Cephalomedinilla* Merr., Philip. J. Sci. Bot. 5:204. 1910.

Type: *Medinilla medinilliana* (Gaudich.) Fosberg & Sachet, Smiths. Contrib. Bot. 45:15. 1980. *Melastoma medinilliana* Gaudich., Freyc. Voy. Uranie Bot. 69, 73. 1826. *Medinilla rosea* Gaudich. ex DC., Prodr. 3:167. 1828; Gaudich., Freyc. Voy. Uranie Bot. t. 106.1829; 484. 1830. *nom. superfl.*; Lectotype: *Herb. Gaudichaud s.n. Marianas, 1817-1820* [P.]

Epiphytic climbing or clump forming subshrubs, rarely terrestrial; branches erect, scandent or pendulous; stem woody or fleshy, terete, quadrangular or subquadrangular, smooth or lenticellate, rarely warty rugose; nodes glabrous or hairy, rarely swollen. Leaves opposite, often anisophyllous, thick, succulent, 3-9 ribbed, margins entire, rarely sinuate towards the apex. Flowers 4-merous, solitary or in simple or compound cymes, axillary or from naked nodes, bracteoles small; calyx tube (hypanthium) short, campanulate rarely quadrangular, adnate to the ovary and projected a little above, lobes spreading; petals 4, spreading, white to lilac; stamens 8 rarely 10, free, often unequal, exserted or included, anthers lanceolate, dehiscing by apical pore, connective with two small tubercles and a spur-like appendage at base; ovary 4 or 5-celled, ovules many, style slender, stigma capitate. Fruit a berry, crowned by the calyx limb; seeds many.

Key to species (based on floral characters)

- 1a. Petals 4-6 x 4 mm; stamens included.....
- *M. anamalaiana*
- 1b. Petals 10-16 x 8-14 mm; stamens exserted.....2
- 2a. Petals white; filaments smaller than anther
- *M. beddomei*

- 2b. Petals amber or crimson; filaments longer than anther.....3
- 3a. Cymes simple; petals ovate, apex cultriform; theca without spur.....**M. malabarica**
- 3b. Cymes compound; petals orbicular; theca with two up-curved spurs.....**M. sahyadrica**

(based on vegetative characters)

- 1a. Climbing epiphytes; leaves orbicular**M. beddomei**
- 1b. Clump forming epiphytes; leaves elliptic, ovate or lanceolate.....2
- 2a. Plants anisophyllous; stem fleshy, quadrangular**M. anamalaiana**
- 2b. Plants isophyllous; stem woody, terete.....3
- 3a. Leaves sessile, base clasping; nodes fulvous hairy**M. sahyadrica**
- 3b. Leaves petiolate, base not clasping; nodes glabrous.....**M. malabarica**

Medinilla anamalaiana Sasidharan & Sujanapal, *Sida* 20: 110.2002.

Figs. 1, 4a¹-a⁴, 5a

Epiphytic, subscandent, clump forming subshrubs; sparingly branched, sometimes rooting from lower nodes; young shoots reddish-brown; stem fleshy, acutely quadrangular or subquadrangular, smooth, forming a winged appearance on drying. *Leaves* anisophyllous, sometimes equal, larger one 7-11.5 x 3-5 cm, smaller 4-6 x 2.5-3.5 cm, elliptic-oblong, membranous, margin entire, apex obtusely acuminate, acumen sometimes twisted, base subcordate or obtuse, 3-ribbed, lateral ribs towards the margins, inconspicuous towards apex; petiole 2-4 mm, flattened, reddish, glabrous. *Flowers* 2-5 from leafless nodes, rarely axillary, in horizontal row, sometimes 2 or 3 on a reduced cyme, peduncle 1-3 mm long; pedicel 2 mm at anthesis, brown, terete, elongating to 4 mm in fruit, bracteoles minute, filiform; petals 4-6 x 4 mm, obliquely obovate, minutely apiculate, rose-pink, 4-6 veined; stamens 8, 5 mm long, included, yellow, filaments 3 mm long; anthers 2 mm long; hypanthium campanulate, subquadrangular, 3 mm across, thinly puberulous, shortly narrowed at mouth with 8 minute teeth; ovary 1.5 mm across, ovoid, 4-celled, connected to hypanthium with 8 membranous appendages; style to 7 mm long; stigma minutely capitate, papillate. *Berries* 4 mm across, urceolate,

glabrous, crowned by a small hypanthial limb; seeds many, yellowish-brown, 1.5 x 1 mm, smooth, ovoid, concave on the side of raphe.

Flowering & Fruiting: January-June.

Distribution: Endemic to the southern Western Ghats (Fig. 2).

Occurrence: South of Palakkad gap (Anamalai and Agasthyamalai).

Specimens Examined: INDIA, Kerala, Thiruvananthapuram district: Attayar 650 m, 3 April 1989, N. Mohanan 5528 (TBGT); Pathanamthitta district: Goodrical Range, Moozhiyar 500 m, 23 May 1984, N Sasidharan 3142 (KFRI); Idukki district: Periyar Tiger Reserve, Vallakkadavu 900 m, 3 June 1995, Jomy Augustine & KP Rajesh 15429 (KFRI); Palakkad district: Parambikulam Wildlife Sanctuary, Pulyala 1000 m, 3 April 2000, P Sujanapal 30043(KFRI).

Medinilla beddomei C. B. Clarke in Hook. f., Fl. Brit. India 2: 548. 1879. Gamble, Fl. Pres. Madras 496. 1919; Vivekananthan in Nair *et al.*, Fl. Tamilnadu 1:159. 1983; Sharma *et al.*, Fl. Karnataka 105. 1984; Manilal, Fl. Silent Valley 108. 1988; Vajravelu, Fl. Palghat 202. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur For. 186. 1996. *M. radicans* sensu Beddome., Ic. 41. t. 184. 1868-1874, non Blume, 1831. *Triplectrum radicans* Wight & Arn. Prodr. 324. 1834.

Figs. 4b¹- b⁴, 5b.

Epiphytic, climbing subshrubs; sparingly branched, extreme branches pendent; stem very woody, terete, nodes swollen, rooting at nodes. *Leaves* 1.5-4 cm across, orbicular to sub-orbicular, petiolate, succulent, thickly coriaceous, shining green above, pale below, margins entire, obtuse at both ends, sometimes base slightly auricled, 3-ribbed, lateral ribs towards the margin, inconspicuous towards the apex, shining above, pale below; petiole 4-7 mm long, terete, yellowish-red. *Flowers* solitary, rarely in pairs, axillary or rarely from leafless nodes; peduncle 4-7 mm long, terete, orange or yellowish-red; pedicels 1.3-2.3 cm long, bracteoles narrow, acuminate, glabrous, orange or yellowish-red, terete; petals 1-1.5 x 0.8-1.2 cm, obliquely obovate-spathulate, white spreading, apex truncate with a small mucro, veins parallel, many; stamens 8, partially exserted, sub-equal, attached in a ring inside the hypanthium; filaments 5-8 mm long, terete, thicker towards the base, yellowish-white; anthers 7-11 mm long, falcate, yellow, apex attenuate, connective dorsally producing a downward ovoid-acute 1.5-2 mm long basal spur, theca with two ellipsoid-acute 2-3 mm long basal spur.; hypanthium 5-8 mm long, yellowish-white, turbinate, wavy along the rim; style filiform, 1.2-1.4 cm long; stigma truncate. *Berry* 5-8 mm across, turbinate, yellowish-green; seeds many,

yellowish.

Flowering & Fruiting: January-June.

Distribution: Endemic to the Southern Western Ghats (Fig. 2).

Occurrence: Anamalai and the Nilgiris.

Specimens Examined: INDIA, Kerala, Thiruvananthapurum district: Pongalappara 1400m, 9 February 1988, N. Mohanan 9694 (TBGT). Idukki district: Periyar Tiger Reserve,

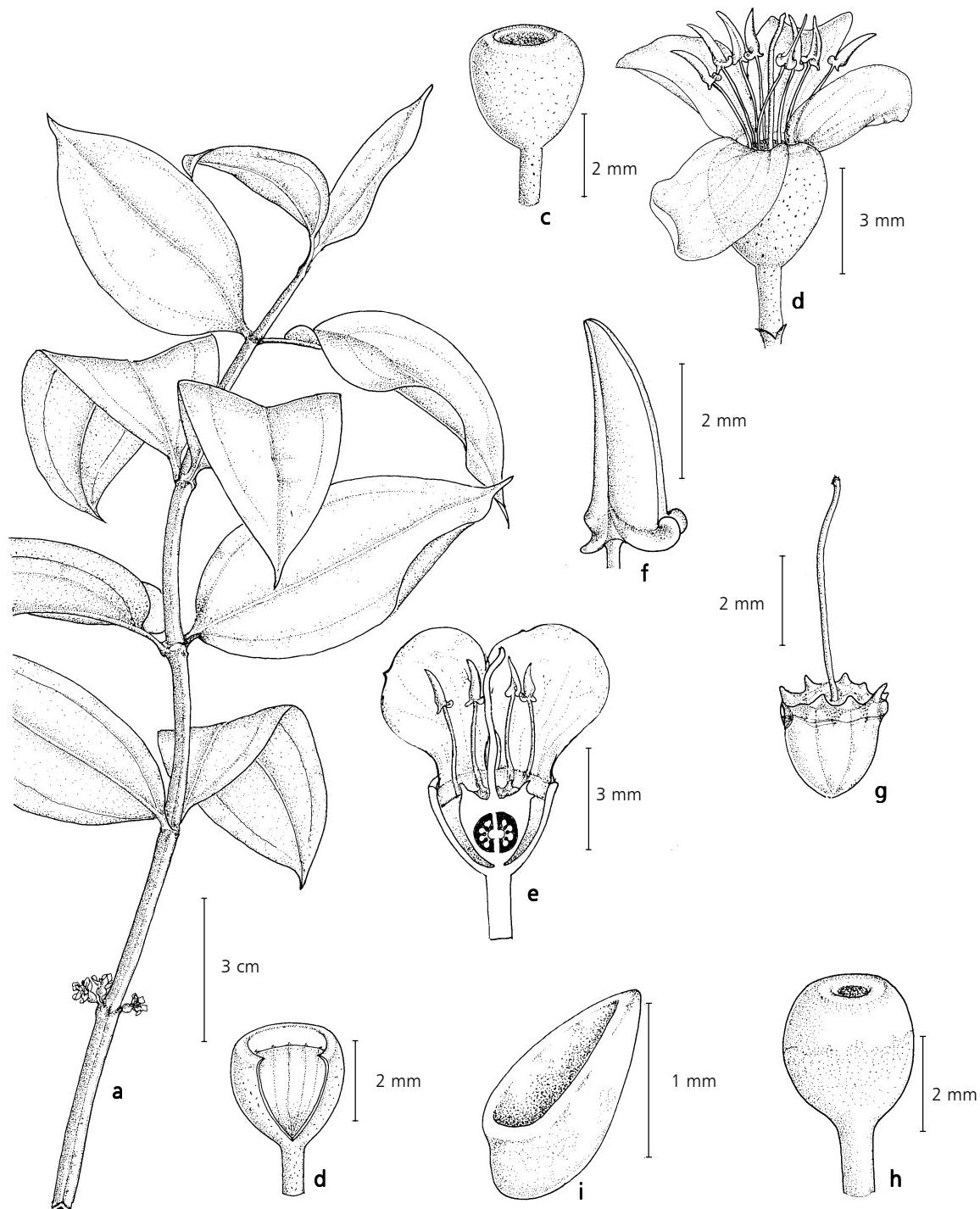


Figure 1. *Medinilla anamalaiana* Sasidharan & Sujanapal – **a.** Flowering twig; **b.** Flower; **c.** Hypanthium; **d.** Hypanthium cut open; **e.** Flower L.S.; **f.** Anther; **g.** Pistil; **h.** Fruit; **i.** Seed

Manalar, 1000m, 12 May 1994, Jomy Augustine 13712 (KFRI). Pathanamthitta district: Moozhiyar 500m, 23 May 1984, N Sasidharan 3149 (KFRI); Pancharamannu 950m, 26 April 2002, E S Abhilash 30807 (KFRI). Palghat district: Parambikulam Wildlife Sanctuary, Puliyala 600m, 26 February 2000, P Sujanapal 30309 (KFRI); Orukomban, 500m, 12 March 2000, P Sujanapal 30664 (KFRI); Silent Valley 800m, 25 April 1985, N Sasidharan 3664 (KFRI); Aruvanpara, 1200m, 10 March 1982, K S Prasannakumar 10313 (CALI). Thrissur district: Vazhachal, Kummaty, 450m, 23 March 1979, N Sasidharan 737 (KFRI); Sholayar 800 m, 20 April 1982, K K N Nair & N G Nair 1744 (KFRI). Wayanad district: Nangakoli 900m, 20 May 1995, Stephen & Michael 8164 (KFRI); Pookote lake surroundings, 1100 m, 20 March 1984, R T Balakrishnan 40060 (CALI). **Tamilnadu:** Anamalai, Uduvanpara, 11 May 1963, A N Henry 5837 (MH). Thirunelveli district: way to Agasthyamala peak, 1700m, 27 May 1963 A N Henry 16333 (MH); Vellimala, 1600m, 29 April 1960, B V Shetty 1460 (MH); Vattapapai 1500m, 22 March 1981, A N Henry 70388 (MH).

Malabar, Coorg, March 1852, Wight 1104 (K, Cibachrome!).

Note: Beddome made detailed description and illustration in his *Icones Plantarum Indiae Orientalis* (1868-1874) based on the collections from Lackadai, Wayanad. In this publication Beddome pointed out "I found the 4 sterile stamens present in one flower out of some 8 or 10 dissected; they were not alternate with other 8 stamens, but opposite to the longer ones". We examined specimens from various localities in the southern Western Ghats and found that all of them had eight stamens, but sometimes they were unequal.

Medinilla malabarica Beddome, Ic. Pl. Ind. Or. 33. t. 157. 1868-1874; C. B. Clarke in Hook. f., Fl. Brit. India 2: 548. 1879; Gamble, Fl. Pres. Madras 496. 1919; Fyson, Fl. S. Ind. Hill. Stat. 1: 229. 1932. Shetty & Vivekananthan, Bull. Bot. Surv. India 14(1-4): 21. 1972; Vivekananthan in Nair et al., Fl. Tamilnadu 1:159. 1983; Manilal, Fl. Silent Valley 109. 1988. Fyson, Fl. S. Ind. Hill. Stat. 1: 229. 1932. (Plate 1C&D). **Figs. 4c¹-c⁴, 5c, d**

Epiphytic, subscendent, clump forming subshrubs; sparingly branched. Stem woody, terete, younger parts reddish-brown. Leaves 3-7 x 2-3.5 cm, elliptic-lanceolate, petiolate, fleshy, thickly coriaceous, dark green above and pale green below, greyish below in younger leaves, glabrous, margin entire, apex acute or obtuse, base cordate, rarely acute, auricled, 3-5 ribbed, ribs reddish-brown, depressed or slightly channelled above, raised below, inner pair little above the base, reaching up to two-third, outer towards the margin, reaching up to one-third; petiole 4-10 mm

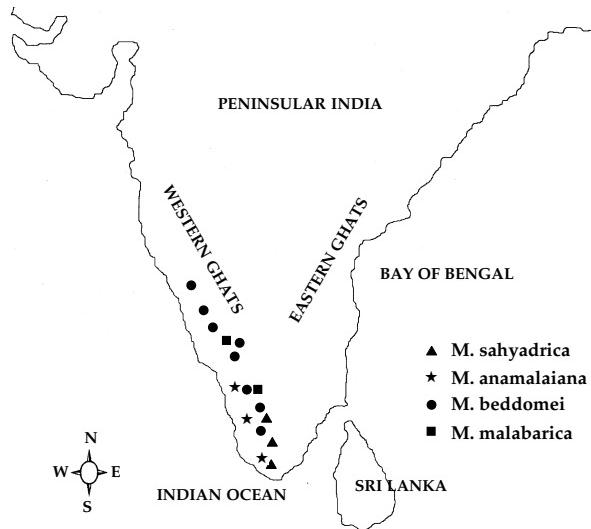


Figure 2. Map showing the distribution of *M. anamalaiana*, *M. beddomei*, *M. malabarica* and *M. sahyadrica*

long, flattened, reddish-brown, brown woolly hairs in the axils. Flowers crimson red, pedicellate, bracteolate, solitary or in simple cyme from naked nodes; peduncle 5-13 mm long, thick, terete, reddish, bracteoles very small, filiform, brown hairy in axils; pedicel 4-7 mm long, terete; petals 11-14 mm long, ovate, apex obliquely acuminate, erect, crimson red, fleshy, 5-9 veined, forking above; stamens 8, partially exserted, 14 mm long; filaments 10-11 mm long, semicircular in cross section, broadened below, narrowed towards and two glandular at apex; anthers 3 mm long, slightly curved outwards, connective dorsally produced into a very small blunt spur; theca convex; hypanthium 6-8 mm in diameter, campanulate, bright red; style 15-17 cm long, terete, linear, narrowed to apex; stigma small, capitate. Berry 7-9 mm across, globose with an apical hypanthial limb, bright red; seeds many, attached to central placenta.

Flowering & Fruiting: September-February.

Distribution: Endemic to the Southern Western Ghats (Fig. 2).

Occurrence: Anamalai and the Nilgiris; rare.

Specimens Examined: INDIA, Kerala, Idukki district: Chinnar, Olikkudy 1600 m, 30 October 1996, K K Sajeev 17481 (KFRI); Munnar, Eravikulam National Park, 2050 m, 29 November 1979, N Sasidharan 1114 (KFRI); Upper Vaguvurai, 2000 m, 14 October 1989, P Bhargavan 90981 (MH); Bhiman Odai, 2200m, 22 October 1996, K Kishore Kumar 18040 (KFRI); Periyar Tiger Reserve, Vellimala, 1690 m, 28 November 1998, Jomy Augustine 18481 (KFRI); Vellimala, 1680m, 13 December 2003, P Sujanapal & Jomy Augustine 30802 (KFRI); Melmanalar, 1660m, 14 December

2003, P Sujanapal & Jomy Augustine 30804 (KFRI); Kottayam district: Devikulam, Umayamalai, 2050m, 6 August 1967, B V Shetty 28323 (MH); Palakkad district: Silent valley, Walakkad, 1700m, 10 November 1983, T Sabu 11421 (CALI); Siruvani, Muthikulam, 1500m, 26

October 1995, Stephen & Michael 8820 (KFRI); way to Walakkad, 1100m, 22 March 2000, Remesh 206503 (KFRI); Wayanad district: Chembra, 1800 m, 18 September 2001, N Anilkumar & Ratheesh Narayan 2672 (MSSH); Chembra, 1804m, 19 December 2003, P Sujanapal 30806 (KFRI).

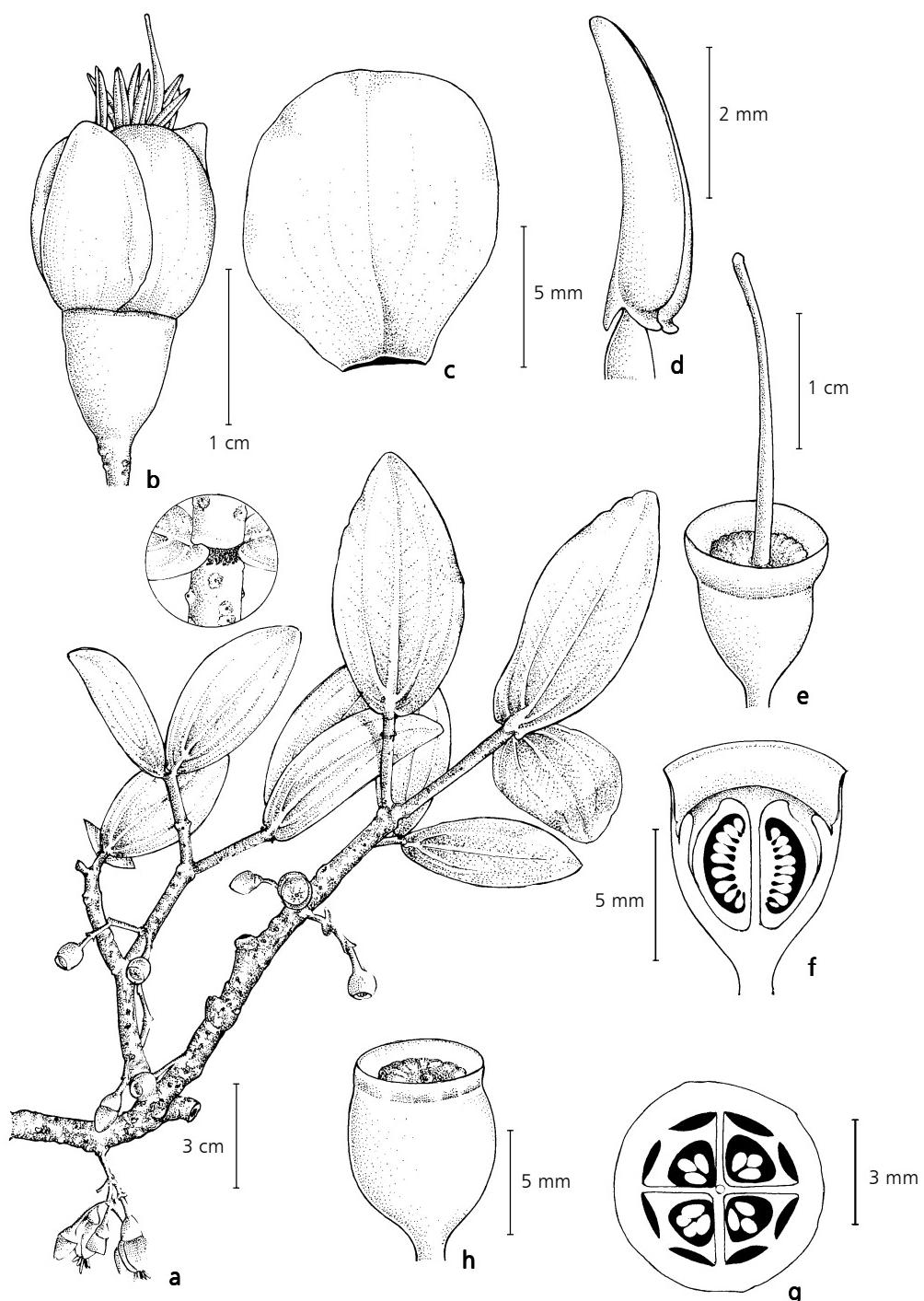


Figure 3. *Medinilla sahyadrica* Sujanapal & Sasidharan – **a.** Flowering twig; **b.** Flower; **c.** Petal; **d.** Stamen; **e.** Hypanthium; **f.** Hypanthium L.S.; **g.** Ovary C.S.; **h.** Fruit.

Tamilnadu, Coimbatore district: Vellingiri top shola, 1600 m, 26 January 1974, E Vajravelu 39277 (MH).

Travancore, Anamalai Forests, *Beddome* 5/69 (Cibachrome, K!); Peninsulae Ind. Or., *Beddome* 12/1871 (Cibachrome, K!).

South India, Travancore High Range, Anamudi Slopes, May 1937, E Barnes 1589 (Cibachrome K!), Ibid. 7500-8000 ft., E Barnes 1590 (Cibachrome, K!).

Medinilla sahyadrica Sujanapal, & Sasidharan, *sp. nov.* Figs. 3, 4d¹-d², 5e, f.

M. fuchsoides sensu Shetty & Karthikeyan, Bull. Bot. Surv. India 18: 215. 1976, non Gardner 1847.

Type: INDIA, Kerala, Idukki district, Periyar Tiger Reserve, Melmanalar, N 9° 36.234' E 77° 21.187' 1642m, 13 December 2003. P Sujanapal & Jomy Augustine 30801 (Holotype, MH; Isotypes, CALI, KFRI, L).

Medinillae malabarica similis in caule lignoso tereto pilis axillaris lanuginosis, hypanthio campanulato, staminibus exsertis. Attamen in foliis sessilibus 5-9 costatis obovato-oblongis, nodis lanuginosis, cymis compositis, petalis orbicularibus, thecis appendicibus basalibus deorsum curvatis, filamentis distaliter eglandulosis differt. In *M. malabarica* folia petiolata 3-5 costata ellipto-lanceolata, nodi glabri, cymae simplices, petala ovata acuminata, thecae inappendiculatae, filamenta distaliter biglandulosae sunt.

Epiphytic bushy subshrubs, rarely lithophytic; branches many, crowded to form umbrella shaped canopy; stem woody, terete, lenticellate, warty rugose; leafy nodes with circular ring of dense woolly hairs (fulvous hairy). Leaves 5-10 x 3-5 cm, elliptic-obovate or oblong-obovate, sessile, fleshy, thickly coriaceous, dark green above and yellowish-green below, distantly crenate towards apex, apex retuse or obtuse, base cordate, clasping, 5-9-ribbed, usually 7, yellowish-green, depressed or slightly channelled above, raised below, inner ribs sub-above, reaching upto apex, middle pair reaching upto two-third, outer towards the margin, reaching upto one-third, sometimes an outer most pair, prominent below. Cymes compound, hanging down in bunches from naked nodes below the leaf, 5-9 flowered; peduncle 1-1.5 cm long, thick, terete, reddish, joints brown hairy; bracts and bracteoles 2 x 1 mm, three toothed. Flowers deflexed, pedicellate, bracteolate; pedicel 0.7-1 cm long, terete; petals 12 mm across, orbicular, erect, amber coloured, fleshy, 4-6 veined; stamens 8, partially exserted, 1.3-1.5 cm long; filaments yellow, 9-10 mm long; anthers

lanceolate, slightly curved, 4-5 mm long, connective dorsally produced to 0.5 mm long blunt spur; theca with two up-curved basal projections, 0.5 mm long; hypanthium 6-7 mm diameter, campanulate, reddish; style creamy, 1.5-1.8 cm long, straight, narrowed towards apex; stigma small, capitate. Berry globose, 7-9 mm across, reddish with an apical hypanthial limb; seeds many, obovoid, 1.5 mm long, attached to central placenta.

The new species can be easily distinguished from its closest relative *M. malabarica* by bushy nature, umbrella shaped canopy, seesile, obovate-oblong leaves with yellowish ribs and clasping leaf bases, lenticellate, densely warty rugate young stem with a ring of fulvous hairs at nodes, compound cymes, orbicular amber coloured petals, anthers with two basal theca and filaments without glandular projections.

Flowering & Fruiting: November-March.

Distribution: Endemic to the Southern Western Ghats (Fig. 2).

Occurrence: Anamalai and Agasthyamalai; rare.

Specimens Examined: INDIA, Kerala, Idukki district: Periyar Tiger Reserve, Melmanalar, 1650m 13 December 1993, Jomy Augustine 12955 (KFRI, Paratype); Vattappara, N 9° 35.047' E 77° 19.846' 1653m 14 December 2003 P Sujanapal & Jomy Augustine 30805 (KFRI, Paratype); Chokkampatty Hills 1750 m, 22 February 1982, C N Mohanan 73441 (MH, Paratype); Sivagiri Hills, 15 December 1981, CN Mohanan 72817 (MH, Paratype). **Tamil Nadu**, Kanyakumari district: Mahendragiri hills, Kandakki, Panagudi 1210 m, 8 December 1969, BV Shetty 33084 (MH, Paratype).

Species affinity

A comparision of morphological characters of the four species is provided (Fig.4). Dendrogram (Fig.6) and 'Agglomeration Schedule' reveal that *M. malabarica* of Peninsular India and *M. fuchsoides* of Sri Lanka are closely allied, compared to other species, with a

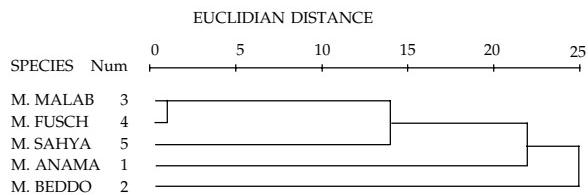


Figure 6. Dendrogram using Average Linkage (Between Groups). M. MALAB- *M. malabarica*; M. FUSCH- *M. fuchsoides*; M. SAHYA- *M. sahyadrica*; M. ANAMA- *M. anamalaiana*; M. BEDDO- *M. beddomei*

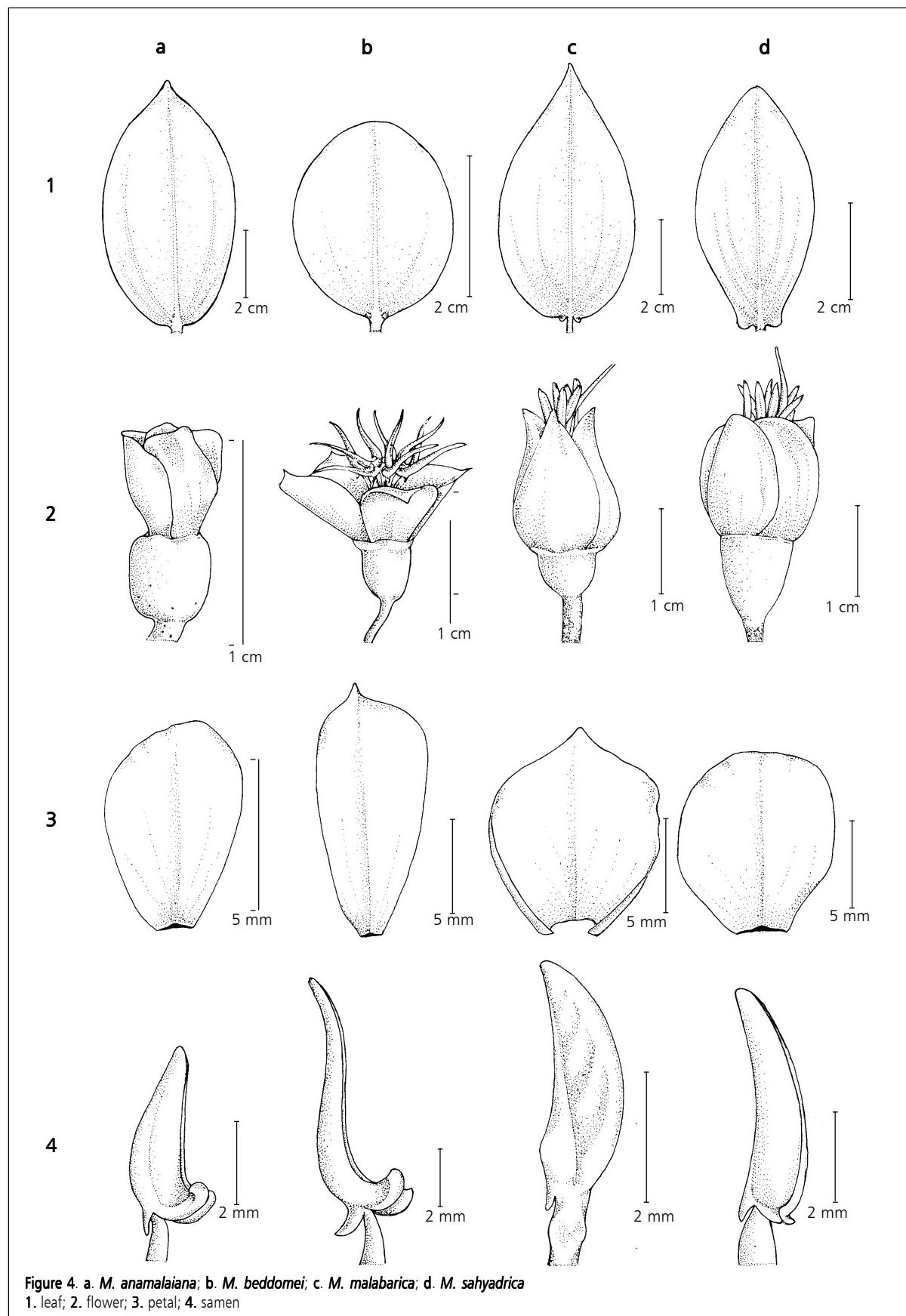




Figure 5. a. *M. anamalaiana*; b. *M. beddomei*; c & d. *M. malabarica*; e & f. *M. sahyadrica*

coefficient of 8.000 (Num 3-4). *M. malabarica* group shows affinity with another species *M. anamalaiana* with a coefficient of 12.667 (Num 1-3) and the new species is intermediate to these two groups with a coefficient 11.000 (Num 3-5). *M. beddomei* is unique from other species with a maximum coefficient of 13.500 (Num 1-2).

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